

# AVIATION AND AERONAUTICAL ENGINEERING



Ch. Colson and D. D. D. D.

Inflating French Kite Balloon on the Western Front

MARCH

1st

1917

## SPECIAL FEATURES

THE APPLICATION OF BALL BEARINGS TO THE AIRPLANE  
SAND-LOAD TESTS ON WING OF CURTISS H-12  
COURSE IN AERODYNAMICS AND AIRPLANE DESIGN  
USE OF AIRCRAFT IN SAVING LIFE AND PROPERTY AT SEA  
THE AIR SERVICE UNDER UNIVERSAL TRAINING  
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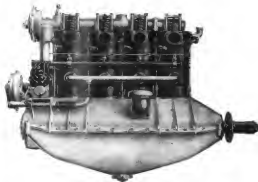
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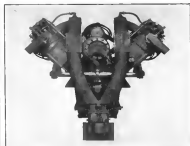
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"I have been flying over the water and the ground, and I have found that the machine is very stable and that the wheels are very good. I have also found that the machine is very easy to control and that it is very safe to fly."

"The machine is very stable and that the wheels are very good. I have also found that the machine is very easy to control and that it is very safe to fly. The machine is very stable and that the wheels are very good. I have also found that the machine is very easy to control and that it is very safe to fly."

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ACKERMAN WHEELS successfully resist violent compression and side thrust shocks. Built in different sizes to carry any load from 500 pounds up to five tons.

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MARCH 1, 1917

# AVIATION

AND  
AERONAUTICAL ENGINEERING

VOL. II. NO. 3

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# AVIATION AND AERONAUTICAL ENGINEERING

EDUCATIONAL COURSE  
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Instructor in Aeronautics  
Mechanical Institute of Technology  
MILWAUKEE, WIS.  
RESEARCH IN WILLIAMS, R.S.

Vol. II

March 1, 1917

No. 3

As long as the principal use of aircraft continues to be for military purposes it is imperative that all the parts used in the construction of airplanes be manufactured in this country out of raw material produced here.

When Brigadier-General George O. Squier took charge of the development of Army aeroplanes he mapped out a complete and concise statement of some of the lines along which scientific research might be solved. Among these problems he laid, only a few months ago, was the development of a wing centering for airplanes, which would meet the following requirements:

"It should weigh not more than five ounces per square foot; it should have reasonably great resistance to flame. It should be reasonably good against action of salt water, moist air, extreme dryness and quick change of temperature. It should not stretch in any direction. It should have tensile strength of at least seventy-five pounds per inch width in any direction."

It is gratifying to know that this problem has been at least partially solved in this country. American dash makers claim to have developed a fabric superior to the fine linen fabric which has been used almost exclusively up to the present time. Whether or not these claims of superiority are upheld, at least it is safe to say that a satisfactory wing covering made in this country from raw material produced in the United States will soon be available.

The spruce situation, at the present time is becoming acute. Large supplies of American spruce have been shipped abroad so that the stock in this country will soon be, if it is not already, running low. But this problem can be solved. Whether the solution lies in the use of wood construction or in a more rapid method for seasoning newly cut spruce, American ingenuity can be counted upon to find that solution.

It is gratifying to have the realization brought home to us that there is no insuperable obstacle to the production of American airplanes, American in the sense that everything that goes into them will have been produced in the United States.

### Training Military Aviators

The training of military aviators requires an amount of time, detailed thought and material which many men, even those closely associated with the aeronautical industry, fail to appreciate. Every training machine requires its staff of pilots, mechanics, motor truck drivers,

motorcycle drivers and others. The training of military pilots requires the constant attention and careful supervision of military men themselves, trained soldiers who, at the same time, are there. If the students' course of training is not to be simply a story of delays and wasted time every school must be equipped with a training machine for every pupil who is in training.

It is possible to train five men to a machine, but when machine and temporary repairs are taken into consideration one machine for every pupil is by no means an excessive allowance. Both French and English experience support this statement. Recent disclosures in the House of Commons have shown that a French training school designed to train seventy men at a time is equipped with seventy training machines and English schools designed to train fifty men at a time are equipped with fifty training machines.

It has been truly said that a first-class mechanic is worth more to a training school or a flying squadron than a first-class pilot. The mechanics are more difficult to recruit in the first place, for almost any young man is willing to learn to fly. They are more difficult to train, and once trained their efficiency or inefficiency determines the amount of time the pilots can spend in the air. A large number of machines means a large number of hangars. It means a large squad of men doing practically nothing but cleaning those machines and hangars. It means providing those men with all the supplies and organization of a commissariat department and a quartermaster's department as well as with quarters in which to live.

Military aviators have to be instructed, and thoroughly instructed, in the military art. They must understand the organization of the units in every branch of the service and they must have some appreciation of what a soldier's life really is. They require a thorough grounding in the knowledge of strategy and tactics. Perhaps the least important side of their instruction is the instruction they receive in the air.

Major-General Leonard Wood said recently,

"The Allies have learned the lesson that it is impossible to turn out aviators in a hurry."

This statement has a special application in this country where the output of airplanes and accessories is at present limited, where almost no men are available who are trained in the duties of administration and where the work of organizing training schools for large numbers of civilian pupils has only just commenced.











By Alexander Klemin and W. B. Ford

The analysis of the stresses in the body is far from complete, and one of the stress-producing causes, namely, the force on a rudder whose center of pressure is fairly high above the center line of the body, seems worthy of consideration. In this brief note, the wire and longitudinal stresses induced by the force on the rudder are worked out for a single panel of a fairly typical rectangular body, with dimensions and areas of tail surfaces as shown in Fig. 1. Owing to the extreme complexity of the problem, a complete analysis is very difficult, and the results arrived at must be only approximately correct.



If similar calculations, however, are applied to a machine which the designer has found satisfactory in practice, they will serve as a criterion for other machines, and at least remain as elements of guesswork.

The rudder forces produce:

- (a) loading in a vertical plane through the middle of the machine;
- (b) twisting about an axis passing through the center of the transverse diagonal (axis in Fig. 2).

To allow for loading, it is sufficient to divide the rudder load equally between the upper and lower planes of the body, and to draw stress diagrams in these planes in the usual manner.

To allow for twisting, the following simple process may be followed: In Fig. 2 are shown diagrammatically the transverse diagonal wires, and the cross members at one point of a body. Assuming that the twisting torque of the rudder

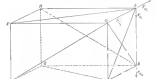


Fig. 2

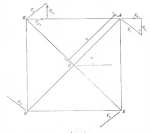
about the point  $O$  is  $J$ , we may reduce  $J$  by four times,  $P_1/P_2$ ,  $P_3/P_4$ ,  $P_5/P_6$ , and the corners of the rectangle, at right angles to the diagonals  $OA$ ,  $OB$ ,  $OC$ , and  $OD$ . Such that  $P = \frac{J}{4}$ , the forces  $J$  acting in such a direction as to give a twisting moment of the same sign as the torque. The forces  $P$  can be assumed into two components  $P_1$  and  $P_2$  on the wires.

The following assumptions are made:

- (a) That the twisting action has appreciable dimensions of the machine (about 100 ft).
- (b) That the 4 wires in question oppose no resistance to the twisting and bending which might follow under action of forces  $P_1$ ,  $P_2$ ,  $P_3$ , and  $P_4$ .

It follows from these premises that no stress comes in the diagonal wires  $AC$ ,  $BD$ , and that the whole of the load is taken up by the tension of the wires in the four longitudinal planes of the body, and the consequent compression in the longitudinal and cross members. A further analysis would be very complex, and this method has the advantage of placing the worst possible load on the members as shown.

The forces  $P_1$  and  $P_2$  can now be resolved in the horizontal and vertical planes of the body as shown in Fig. 3, and, as they cannot be resolved into members which are in a plane at right angles to these



These in Fig. 3, where only those wires which are in tension in the longitudinal plane are shown,  $P_1$  and  $P_2$ , and  $P_3$  and  $P_4$  in the vertical plane. The forces  $P_1$  and  $P_2$  are in the vertical plane, and the forces  $P_3$  and  $P_4$  are in the horizontal plane.

In Fig. 3,  $P_1$  and  $P_2$  are the forces in the vertical plane, and  $P_3$  and  $P_4$  are the forces in the horizontal plane. The forces  $P_1$  and  $P_2$  are in the vertical plane, and the forces  $P_3$  and  $P_4$  are in the horizontal plane.

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The results are summarized in the following table:

Force	Wire	Area	Stress	Force	Wire	Area	Stress
$P_1$	1	100	1000	$P_3$	3	100	1000
$P_2$	2	100	1000	$P_4$	4	100	1000
$P_1$	5	100	1000	$P_3$	6	100	1000
$P_2$	7	100	1000	$P_4$	8	100	1000
$P_1$	9	100	1000	$P_3$	10	100	1000
$P_2$	11	100	1000	$P_4$	12	100	1000
$P_1$	13	100	1000	$P_3$	14	100	1000
$P_2$	15	100	1000	$P_4$	16	100	1000
$P_1$	17	100	1000	$P_3$	18	100	1000
$P_2$	19	100	1000	$P_4$	20	100	1000
$P_1$	21	100	1000	$P_3$	22	100	1000
$P_2$	23	100	1000	$P_4$	24	100	1000
$P_1$	25	100	1000	$P_3$	26	100	1000
$P_2$	27	100	1000	$P_4$	28	100	1000
$P_1$	29	100	1000	$P_3$	30	100	1000
$P_2$	31	100	1000	$P_4$	32	100	1000
$P_1$	33	100	1000	$P_3$	34	100	1000
$P_2$	35	100	1000	$P_4$	36	100	1000
$P_1$	37	100	1000	$P_3$	38	100	1000
$P_2$	39	100	1000	$P_4$	40	100	1000
$P_1$	41	100	1000	$P_3$	42	100	1000
$P_2$	43	100	1000	$P_4$	44	100	1000
$P_1$	45	100	1000	$P_3$	46	100	1000
$P_2$	47	100	1000	$P_4$	48	100	1000
$P_1$	49	100	1000	$P_3$	50	100	1000
$P_2$	51	100	1000	$P_4$	52	100	1000
$P_1$	53	100	1000	$P_3$	54	100	1000
$P_2$	55	100	1000	$P_4$	56	100	1000
$P_1$	57	100	1000	$P_3$	58	100	1000
$P_2$	59	100	1000	$P_4$	60	100	1000
$P_1$	61	100	1000	$P_3$	62	100	1000
$P_2$	63	100	1000	$P_4$	64	100	1000
$P_1$	65	100	1000	$P_3$	66	100	1000
$P_2$	67	100	1000	$P_4$	68	100	1000
$P_1$	69	100	1000	$P_3$	70	100	1000
$P_2$	71	100	1000	$P_4$	72	100	1000
$P_1$	73	100	1000	$P_3$	74	100	1000
$P_2$	75	100	1000	$P_4$	76	100	1000
$P_1$	77	100	1000	$P_3$	78	100	1000
$P_2$	79	100	1000	$P_4$	80	100	1000
$P_1$	81	100	1000	$P_3$	82	100	1000
$P_2$	83	100	1000	$P_4$	84	100	1000
$P_1$	85	100	1000	$P_3$	86	100	1000
$P_2$	87	100	1000	$P_4$	88	100	1000
$P_1$	89	100	1000	$P_3$	90	100	1000
$P_2$	91	100	1000	$P_4$	92	100	1000
$P_1$	93	100	1000	$P_3$	94	100	1000
$P_2$	95	100	1000	$P_4$	96	100	1000
$P_1$	97	100	1000	$P_3$	98	100	1000
$P_2$	99	100	1000	$P_4$	100	100	1000

It is seen from this table that the effect of the rudder loads is to create stresses which are not negligible, and that each station of the air frame would be subjected to a load which is not negligible, and that each station of the air frame would be subjected to a load which is not negligible.

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It is seen from this table that the effect of the rudder loads is to create stresses which are not negligible, and that each station of the air frame would be subjected to a load which is not negligible, and that each station of the air frame would be subjected to a load which is not negligible.

follow from the ordinary calculations under Army specifications. Incidentally, it is seen that the stresses due to having the corners of lower, sometimes of greater value than those

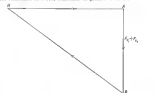


Fig. 4

obtained from the cornered air body, showing that it is advisable to carry through both air and landing stress calculations.

## News of the Fortnight

### K. M. HAGAR RESIGNS

K. M. Hagar has resigned from the position of Chief of the Wright-Sikorsky Aircraft Corporation. He will assume the post of chief of staff of the National Aeronautics Administration. He will assume the post of chief of staff of the National Aeronautics Administration. He will assume the post of chief of staff of the National Aeronautics Administration.

### Box Shore, Long Island, to Have Large Aeronautics Station

Plans have been made to build a large aeronautics station at Box Shore, Long Island. The station will be built on a large tract of land. The station will be built on a large tract of land. The station will be built on a large tract of land.

### Men Wanted for Aviation Section

The Army wants men for the Aviation Section. The men should be men of high caliber. The men should be men of high caliber. The men should be men of high caliber.

### Miscellaneous

Phillips Hager, with a passenger inside a light airplane, was killed in a crash landing. The airplane was flying over a field. The airplane was flying over a field. The airplane was flying over a field.

### Legislation for Civilian Fleets

Legislation is being introduced in Congress to create a civilian fleet. The fleet will be used for the transport of passengers and cargo. The fleet will be used for the transport of passengers and cargo. The fleet will be used for the transport of passengers and cargo.

### Representative Wins while opposing

Representative Wins while opposing the proposed legislation. He has won the support of many of his constituents. He has won the support of many of his constituents. He has won the support of many of his constituents.

### Men Wanted for Aviation Section

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### Miscellaneous

Phillips Hager, with a passenger inside a light airplane, was killed in a crash landing. The airplane was flying over a field. The airplane was flying over a field. The airplane was flying over a field.



[illegible]

The physical condition to be drawn from such observations, as shown in these

[illegible]

Start year	Stations open	Area type	Stations open	Area type	Stations open	Area type	Total	Stations open
1	4		4	3	4	3	15	10
1.2	1.2	5		3		1	10	10
1.6	40	4		8	3	4.5	55.5	55.5

```

1  # Import the data
2  # Import the data
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7  # Import the data
8  # Import the data
9  # Import the data
10 # Import the data
11

```

In this novel the balloon continued to rise! In a mid-air detour, restricted membership of DSI was revealed. When Theodor's reserved nonchalance met and Crumboltz's were dead. They were released from their ties to the ground; all were punished before they could ride the tubes to their fate. Theodor's notes are characteristic of the

The physical condition to be drawn from such observations, as shown in these

If time is allowed for a gradual continuation, or if for some time before the event, musical events or activities are subjected to a gradually increasing degree of organ deficiency, the capacity of the lungs to secrete oxygen with develop is a degree sufficient to meet them, to afford protection against the disease that a doctor that of I measure has yet all about

## The Air Service Under Universal Training

Table 2 shows the exact appointment of officers and enlisted men in both the Army and the United States Air Force. The table indicates that the General Staff considers a total commitment of 31,200 officers and men sufficient for the aerial warfare needs of the United States. The

TABLE II

[illegible][illegible]



## Cord Tire Construction

Goodyear Cord Tires for airplanes are built up of thousands of light, pliant cords, densely strung, cradled side by side in pure rubber, without interweave.

Each cord is stressed precisely to the same tension, that the burden of sustaining such violent shocks as that of landing shall be evenly borne.

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--	---

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